## Space Weather Forecast

Issued on Sunday, 03 September 2023 at 13:11 Local

**This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales**

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**Space Weather Forecast Headline: G1-G2 Moderate storms expected 03 Sep due to CME arrivals and ongoing fast winds. Decreasing risk of Moderate flares.**

**Analysis of Space Weather Activity over past 24 hours**

**Solar Activity:** Moderate levels of activity with a couple of Moderate flares from an active sunspot region in the northwest. This region has now rotated off the visible disc around the northwest limb. The other three sunspot regions on the disc remain smaller and simple, and are either stable or showing signs of decay. A new sunspot region has quickly emerged in the south in the southeast, so may be an area to keep an eye on.

The Coronal Mass Ejection (CME) associated with the Moderate flare from the sunspot in the northwest is missing Earth. Further CMEs have emerged from this same region but are considered likely to also miss Earth, pending analysis. A further filament eruption was observed from the northwest disc, with a CME identified as coming off from this eruption, but has been analysed to not be Earth-directed.

**Solar Wind / Geomagnetic Activity:** A high speed stream gave Elevated solar winds at first, with the influence gradually easing as solar winds show a decreasing trend to Slightly Elevated levels. Total Interplanetary Magnetic Field (IMF) was Weak at first, but increased to Moderate for a time. The north-south direction was predominately southward. Geomagnetic activity has been Active to Minor Storm (G1/Kp4-5).

**Energetic Particles / Solar Radiation:** The count rate of energetic particles (high energy protons) has eased towards background levels, and remained well below the Minor Storm (S1) level.

**Four-Day Space Weather Forecast Summary**

**Solar Activity:** A chance of Moderate activity Day 1 (03 Sep), with a further risk of Moderate flares from the active sunspot region moving off the northwest limb, but then easing to mainly Low activity as this rotates further onto the far-side, with the other spots on the disc currently smaller and simpler.

**Solar Wind / Geomagnetic Activity:** A CME was expected to arrive early Day 1, and is from the moderately fast CME which occurred alongside the Moderate flare on 01 Sep. This may still arrive at some point Day 1 (03 Sep). If it does arrive then ongoing CME influence is likely going into Day 2, before easing. However winds are likely to remain Elevated due to the fast winds of two coronal holes. Overall Active to Minor storm (G1/Kp4-5) intervals are expected on Day 1 (03 Sep), but with a chance of rising to give a spell of Moderate storms (G2/Kp6) with any CME arrival, and a slight chance of an isolated Strong Storm (G3/Kp7) interval. Conditions easing Day 2 (04 Sep) onward to mainly Quiet to Unsettled (Kp0-3) with Active (Kp4) intervals, and a decreasing chance of Minor Storm intervals (G1/Kp5).

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**Energetic Particles / Solar Radiation:** High energy protons are expected to continue at around background levels, but with an increased chance for a Minor proton storm (S1) on Day 1 (03 Sep), in association with the Moderate flare from the sunspot region rotating around the northwest limb. As this area rotates further around the far side the risk is much reduced.

**Geomagnetic Storms:**

| Geo-Magnetic Storm Probability (Exceedance) | Level | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| Minor or Moderate | G1 to G2 | Yes | 70 | 30 | 10 | 10 |
| Strong | G3 | No | 10 | 1 | 1 | 1 |
| Severe | G4 | No | 1 | 1 | 1 | 1 |
| Extreme | G5 | No | 1 | 1 | 1 | 1 |

**Radio Blackouts - X Ray Flares:**

| X Ray Flares Probability | Level | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| Active | R1-R2 M Class | Yes | 35 | 20 | 20 | 30 |
| Very Active | R3 to R5 X | No | 2 | 1 | 1 | 1 |

**Solar Radiation Storms - (High Energy Protons):**

| Radiation Storms Probability (Exceedance) | Level ($cm^{-2}$ $sr^{-1}$ $s^{-1}$) | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| Active | ≥ S1 | No | 30 | 5 | 2 | 2 |
| Very Active | ≥ S3 * | No | 1 | 1 | 1 | 1 |

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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